CLAIMS

1. A method of operating a fuel reformer, the method comprising the steps of:

advancing a first air/fuel mixture having a first air-to-fuel ratio into the fuel reformer,

entrapping soot produced by the fuel reformer in a soot trap,

determining if a soot purge of the soot trap is to be performed and generating a purge-soot signal in response thereto, and

advancing a second air/fuel mixture having a second air-to-fuel ratio into the fuel reformer in response to generation of the purge-soot signal, wherein the second air-to-fuel ratio is greater than the first air-to-fuel ratio.

2. The method of 1, wherein the determining step comprises the step of sensing the amount of soot within the soot trap.

3. The method of claim 2, wherein the sensing step includes the step of generating a soot accumulation control signal when the amount of soot within the soot trap reaches a predetermined accumulation level, and wherein the step of advancing the second air/fuel mixture includes advancing the second air/fuel mixture in response to generation of the soot accumulation control signal.

4. The method of claim 2, wherein the sensing step comprises sensing a pressure drop across the soot trap.

5. The method of claim 1, wherein the step of advancing the second air/fuel mixture includes advancing the second air/fuel mixture for a predetermined period of time to purge the soot trap of soot.

6. The method of claim 1, wherein the second air/fuel mixture is substantially devoid of fuel.

7. The method of claim 1, wherein the second air/fuel mixture is devoid of fuel.

8. The method of claim 1, wherein the determining step comprises determining if a predetermined period of time has elapsed since the soot trap was last purged of soot and generating a time-lapsed control signal in response thereto, and the step of advancing the second air/fuel mixture comprises advancing the second air/fuel mixture in response to generation of the time-lapsed control signal.

9. The method of claim 1, further comprising the step of advancing a third air/fuel mixture having the first air-to-fuel ratio into the fuel reformer subsequent to the step of advancing the second air/fuel mixture.

10. The method of claim 1, wherein the determining step comprises detecting a reformer shutdown request control signal, and the step of advancing the second air/fuel mixture comprises advancing the second air/fuel mixture in response to detection of the reformer shutdown request control signal.

11. The method of claim 1, wherein the determining step comprises generating a high-load control signal when an engine associated with the fuel reformer experiences a high load condition, and the step of advancing the second air/fuel mixture comprises advancing the second air/fuel mixture in response to generation of the high-load control signal.

12. A fuel reformer assembly for producing reformate gas, the fuel reformer assembly comprising:

a fuel reformer having (i) an air/fuel input assembly and (ii) a soot trap, and

a reformer controller electrically coupled to the air/fuel input assembly, the controller comprising (i) a processing unit, and (ii) a memory unit electrically coupled to the processing unit, the memory unit having stored therein a plurality of instructions which, when executed by the processing unit, causes the processing unit to:

operate the air/fuel input assembly so as to advance a first air/fuel mixture with a first air-to-fuel ratio into the fuel reformer,

determine if a soot purge of the soot trap is to be performed and generate a purge-soot signal in response thereto, and

operate the air/fuel input assembly so as to advance a second air/fuel mixture having a second air-to-fuel ratio greater than the first air-to-fuel ratio into the fuel reformer.

13. The fuel reformer assembly of claim 12, wherein the air/fuel input assembly comprises a fuel injector, and the reformer controller is electrically coupled to the fuel injector.

14. The fuel reformer assembly of claim 12, wherein the air/fuel input assembly comprises an electrically-operated air inlet valve, and the reformer controller is electrically coupled to the air inlet valve.

15. The fuel reformer assembly of claim 12, further comprising a sensor to sense the amount of soot within the soot trap, wherein the plurality of instructions, when executed by the processing unit, further causes the processing unit to:

generate a soot-content control signal when the amount of soot particulate accumulation within the soot trap reaches a predetermined level, and

operate the air/fuel input assembly to advance the second air/fuel mixture in response to generation of the soot-content control signal.

16. The fuel reformer assembly of claim 12, further comprising a pressure sensor to sense the pressure drop across the soot trap, wherein the plurality of instructions, when executed by the processing unit, further causes the processing unit to:

generate a pressure-reached control signal when the pressure drop across the soot trap reaches a predetermined level, and

operate the air/fuel input assembly to advance the second air/fuel mixture in response to generation of the pressure-reached control signal.

17. The fuel reformer assembly of claim 12, wherein the plurality of instructions, when executed by the processing unit, further causes the processing unit to:

determine when a predetermined period of time has elapsed since soot was last purged from the soot trap, and generate a time-lapsed control signal in response thereto, and

operate the air/fuel input assembly to advance the second air/fuel mixture in response to generation of the time-lapsed control signal.

18. The fuel reformer assembly of claim 12, wherein the fuel reformer comprises a plasma fuel reformer.

19. The fuel reformer assembly of claim 12, wherein the fuel reformer comprises a housing defining a reformate gas outlet, and the soot trap is positioned within the housing at a position upstream of the reformate gas outlet.

20. The fuel reformer assembly of claim 12, further comprising a conduit fluidly coupled to the fuel reformer, wherein the soot trap is positioned within the conduit.

21. A method of operating a fuel reformer comprising the step of:

entrapping soot generated by the fuel reformer in a soot trap, and

advancing air in the absence of fuel into the fuel reformer so as to combust soot present in the soot trap.

22. The method of claim 21, further comprising the step of advancing a mixture of fuel and air into the fuel reformer prior to the step of advancing air in the absence of fuel into the fuel reformer.

23. The method of claim 21, wherein the advancing step comprises ceasing operation of a fuel injector.

24. The method of claim 21, wherein the advancing step is performed at predetermined time intervals.

25. The method of claim 21, further comprising the step of advancing air in the presence of fuel into the fuel reformer subsequent to completion of the step of advancing air in the absence of fuel.

26. The method of claim 21, further comprising the step of determining the amount of soot within the soot trap, wherein the advancing step comprises advancing air in the absence of fuel if the amount of soot within the soot trap is greater than or equal to a predetermined amount.

27. The method of claim 21, further comprising the step of determining if a predetermined period of time has elapsed since soot was last purged from the soot trap, wherein the advancing step comprises advancing air in the absence of fuel when the predetermined period of time has lapsed.

28. The method of claim 21, further comprising the step of determining a pressure drop across the soot trap, wherein the advancing step comprises advancing air in the absence of fuel if the pressure drop across the soot trap is greater than or equal to a predetermined value.